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FOREST INSECT CONDITIONS IN THE CENTRAL AND SOUTHERN ROCKY MOUNTAINS AND THE GREAT PLAINS, 1951

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A policy of the United States Government, as stated in Public Law 110, the Forest Pest Control Act, an Act passed by the 80th Congress, is to prevent, retard, control, suppress, or eradicate destructive insects on or threatening all forest lands. To accomplish these things requires close and continued cooperation between the field laboratories of the Division of Forest Insect Investigations and all forest land owners and managers. Fortunately, there is an increasing desire, even a demand, of the owners and managers, both public and private, to cooperate. In cooperating, they want to know: (1) the status and the trend of forest insects; (2) what to do and how to protect the forests from destructive insects; (3) who will do whatever work is needed concerning that protection; and (4) where the owners and managers fit into the programs.

The Division of Forest Insect Investigations, Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, has been directed by the Secretary, under authority granted to him by the Forest Pest Control Act, to coordinate detection and to appraise all forest insect conditions, to determine whatever action is advisable so as to control or prevent insect outbreaks, and to provide technical assistance to forest owners and managers on the action taken to protect the forests. Each field laboratory of the Division is part of this program.

The Fort Collins laboratory is responsible for appraising and reporting the forest insect conditions on over 101 million acres of forest land within the central and southern Rocky Mountains and the Great Plains. These forested lands are within the assigned territory which comprises all of Forest Service Regions 2 and 3 and the plains country of Region 8. Included are 30 National Forests, 7 National Parks, 29 National Monuments, 1 National Memorial, numerous Indian Reservations, other federal lands, as well as state, community, and private parks and forest holdings. The territory grosses over 601 million acres in Arizona, Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming.

The task of recognizing forest insect conditions within such a large area is, in itself, a big job, a job of good cooperation. It includes the detection and immediate reporting of each forest insect species as it may be in or threatening to come to outbreak proportions. Detection is the big job that the laboratory must rely almost entirely upon the cooperators to perform, not in the light of "buck passing" but of necessity and by circumstance. The cooperators, forest owners and managers, federal, state, and private, send their detection reports to the laboratory. Thus the laboratory is kept currently informed by scores of observers regarding forest insects within the laboratory's territory of operation. This, in fact, is part of the directions of the Forest Pest Control Act. Also, in fact, this is what has been the case for many years.

The detection reports are integral parts of the overall survey and control program of the laboratory. They are reviewed in detail and considered in the light of their proportionate national importance. They, of course, are the bases of reconnaissance and subsequent appraisal surveys.

Reconnaissance and appraisal surveys are made by or under the direct supervision of the survey personnel of the laboratory. The reconnaissance survey is made to determine the insect and the host tree involved, and the extent, exact location, and trend of the infestation.

Appraisal surveys are systematic samplings of insect infestations for detailed information to be used in planning a control program or to determine the worth-whileness of a completed control program.

Upon termination, reconnaissance and appraisal surveys, together with suggestions and recommendations for control, are reported to the forest managers for final control considerations. Decisions for control are made by the forest managers, after proper considerations and, generally, after consultations with the survey organization. Thus, the products of survey are utilized to the profit of the forest manager and the nation as a whole.

Cooperation has been excellent. As stated above, cooperation, while part of the directives of the Forest Pest Control Act, has been part of forest protection for many years. Now, however, there is a concerted start toward organization and expansion of cooperation. Part of this movement is to explain to the nation its responsibility to forestry. With the increasing values and respects for forests and their products, explanations of cooperative protection are easier to make. An unfortunate, probably temporary handicap, to the Division in all-out and satisfactory participation in cooperation is the under-staffing of the laboratories caused by the necessary concentration of personnel activities on specific jobs, such as the spruce beetle control project in Colorado. As a consequence, proper follow-ups cannot be made on all detection reports. The laboratory, in considering each detection report, must decide on the importance and priority of each on the basis of its probable national importance and accord it appropriate attention. Regardless of priority, each detection report must be acknowledged.

The spruce beetle outbreak in Colorado again in 1951 placed a great demand on the Fort Collins laboratory for surveys and assistance on control. As a consequence, some of the insect problems of the territory were neglected. In spite of the normal limitations of manpower and time, it was possible to complete most of the forest insect surveys within the territory. A return to a status nearer to that whereby all detection reports will be given proper attention is likely in the near future with the probable reduction of the spruce beetle populations to an endemic status and the maintenance of other destructive insects at relatively low levels.

With respect to cooperation, from an inter-division standpoint, it is of general interest to point out that most of the other laboratories of the Division, actually all that could, interrupted their investigations and

curtailed their work during the 1951 field season. In August, personnel from those laboratories and the Divisional office obligingly came on to the Engelmann spruce beetle control project in Colorado to provide the Fort Collins laboratory with additional needed technical assistance on both surveys and control activities.

Engelmann Spruce Beetle in Engelmann Spruce

No bark beetle in one outbreak has caused so much destruction as has the Engelmann spruce beetle in the 10 years since 1941. In this time, the insect has killed an estimated 3.8 billion board feet of spruce and .5 billion board feet of lodgepole pine. The outbreak, however, is on the decline as a result of control, artificial and natural. But, over 10.6 billion board feet of green spruce in the immediate vicinity is still threatened.

The 1950 survey of the outbreak revealed that 1,546,600 trees, attacked in 1950 on 91,730 acres would need to be treated with insecticide during 1951. By February 1, 1951, however, a general cold wave hit the outbreak; temperatures as low as -56°F. were recorded. Crews, in February and March, travelling on snow shoes, skis, and by mechanized snow sleds, surveyed in all the major areas of the spruce beetle infestation. The results of the surveys showed extremely high larval mortality because of the "freeze". Subsequent surveys were made to determine the overall winter mortality of the beetle.

These surveys were started in June but terminated in early July because no funds had been authorized either for surveys or control. The surveys, fortunately, were reactivated in late August when Congress appropriated money for them. It was found that the beetle populations in some areas had been practically eliminated, in many other areas the populations had been drastically reduced, but in a few areas the beetle populations were relatively undisturbed by the cold and woodpeckers. While natural factors during the winter had definitely bettered the spruce beetle situation, the outbreak was still a major affair. The delay in allotment of funds, fortunately, had been counteracted by the winter mortality of beetles and a control program of reduced size was entomologically feasible.

The late appropriation of funds, however, necessitated the start of control activities concurrently with surveys. Time did not permit the more logical procedure whereby control would follow survey. Consequently, some minor false starts in control were made before the results of survey could be evaluated. Regardless, control got under way and the Forest Service, calling in detailers from all its regions, did a miraculous job of treating over 199,000 beetle-infested spruce by the time winter weather caused termination of the work. The spruce beetle infestation in Colorado is approaching endemic proportions. Another year of intensive control will reduce the outbreak to a position requiring only the normal annual survey and maintenance control.

Late summer and early fall surveys of 1951-attacked trees were made to determine the development and trend of the outbreaks. Approximately 2.4 million acres of land were examined; the susceptible spruce type was scouted

and the epidemic areas were surveyed. The outbreak area was found to have been reduced in size; the intensity of the attacks was noticeably less. Chemical control in 1950, the "freeze" of 1950-51, and feeding by a growing population of woodpeckers had materially reduced the beetle populations. The outbreak has been contained; it has not spread in any direction. It is significant to record that the 1951-beetle attacks have varied considerably in character. The predominant attacks were not the normal "full attack", rather, they were predominantly "basal fill-ins" and "partial attacks".1/

There are an estimated 100,000 1951-infested trees within the Kremmling control area that will need treatment and 125,000 within the Eagle control area, a total of 225,000 trees. An estimated 175,000 spruce will be infested in 1952 by beetles emerging from untreated, infested 1950-attacks. It is expected that these 175,000 and the 225,000 1951-trees, a total of 400,000, will need to be treated in 1952. Provided the requested funds are allotted or assured by the second quarter of 1952 so surveys and plans can be made, the outbreak probably will be reduced to a near endemic status.

Engelmann Spruce Beetle in Lodgepole Pine

Lodgepole pine continued to be an unfortunate victim of the Engelmann spruce beetle. The beetle population in 1951 was so light and so few lodgepoles were killed by the beetles that tallies of attacked lodgepole pine were not made by the survey crews.

Black Hills Beetle in Ponderosa Pine

The "freezes" of November 1950 and January-February 1951 were very effective natural factors in the control of the Black Hills beetle. On the Roosevelt National Forest, the outbreak suffered a distinct setback from an estimated 36,230 attacked ponderosa pines in 1950 to 8,400 in 1951. While reduced, the infestation remains in outbreak proportions. It would be strategic in 1952 to proceed with control measures against the outbreak and reduce the beetle population to an endemic level.

The beetle populations in the Denver Mountain Parks area, on the Black Forest, and on the Arapaho and Pike National Forests were reduced to endemic level by the "freezes". On the Black Forest, in particular, the infestation was reduced from an estimated 4,000 1950-attacked trees to approximately 300 attacked trees in 1951.

1/ full attack - spruce infested in over 50 percent of its circumference by 1951-attacking beetles.
partial attack - spruce infested in less than 50 percent of its circumference by 1951-attacking beetles.
basal fill-in - spruce infested in 1950 as full or partial attacks and reinfested in 1951 in the moist basal portion; height of fill-in attack ranges from a few inches above root collar to approximately 2 feet.

No spectacular decrease as a result of low winter temperatures occured in the Black Hills beetle populations on the San Isabel, San Juan, Uncompahgre, and Rio Grande National Forests. On these forests, a limited amount of control was carried out in 1951. The Forest Service treated 2,980 ponderosa pines on the San Isabel, 2,258 on the San Juan, and 1,063 on the Uncompahgre. Late fall surveys revealed the following numbers of 1951-attacked trees, 1,000 on the San Isabel, 750 on the San Juan, 500 on the Uncompahgre, and 350 on the Rio Grande.

The Black Hills beetle did not appear to suffer abnormally high winter (1950-51) mortality on the Black Hills and Harney National Forests. Maintenance control was carried out in 1951; 1,278 ponderosa pines were treated. The 1951 survey estimates show 1,000 beetle-attacked trees. It is apparent that the control efforts on these two Forests, since 1948 when the outbreak numbered 53,000 infested trees, have been very effective and that annual maintenance control is feasible.

The beetle population in ponderosa and limber pines on the Bighorn National Forest and neighboring state and private lands was reduced as a probable result of the 1950-1951 low winter temperatures. The estimated 1951-attacks, mostly on private lands, number 7,500 trees.

Douglas-fir Beetle in Douglas-fir

The extremely low temperatures during the winter of 1950-1951 greatly reduced the Douglas-fir beetle populations in the Rocky Mountain National Park-Roosevelt National Forest outbreak area. No 1951 control project was advisable and the infestation possibly is at an endemic level.

The Douglas-fir beetle is causing concern on the Santa Fe National Forest where an estimated loss of 100,000 board feet of Douglas-fir occurred in 1951. It is questionable that the loss is entirely contributable to the bark beetles; drought conditions have been severe. Indirect control measures by way of logging were suggested for late 1951.

Roundheaded Pine Beetle in Ponderosa Pine

The roundheaded pine beetle is the primary cause of tree mortality in an area of bark beetle infestation on the Lincoln National Forest. Associated with the beetle, however, and playing important roles in tree mortality are the southwestern pine beetle, the Colorado pine beetle, and two engraver beetles, the Cloudcroft ips and Knaus' ips. From an estimated 13,830 ponderosa pines killed in 1950 to approximately 1,010 1951-attacks is a decided decrease in the infestations on 3,624 acres. This reduction to an endemic level has been attributed to a high natural mortality in beetle populations during the fall of 1950. No artificial control had been attempted. Drought conditions prevail on the Lincoln, but it is impossible to predict whether or not the endemic condition will persist.

Few attacks of the roundheaded pine beetle were observed on the Mescalero Apache Indian Reservation. Drought in that area, however, was resulting in tree mortality and could serve as the forerunner of a beetle attack.

On the Santa Fe National Forest, an increase of beetle-killed pinon and ponderosa pine is apparent. The kills, however, are atypical of beetle-killed trees. The fading of the foliage is more gradual and less uniform, beetle attacks themselves are few, blue stain is streaked, and the production of beetle brood is very light. Dendroctonus and Ips species are involved in the ponderosa kills; Ips species alone are attacking pinon. Attacks on pinon, while partly prompted by drought, have been encouraged by a build-up of Ips engravers in slash created by road and line construction.

Mortality of ponderosa pine on the Coconino National Forest in and neighboring the Fort Valley Experimental Forest also can be contributed to drought conditions. Bark beetle attacks were practically nil.

Surveys of ponderosa pine mortality were made on the south end of the Sandias on the Cibola National Forest. There too, drought was the principal cause of death of the trees. Bark and engraver beetle attacks were very light.

Fir Engraver Beetle in White Fir

The fir engraver beetle situation on the Cibola National Forest worsened rather than improved, partly because of the failure to log out beetle-infested white firs during the winter of 1950-1951 and to apply chemical control measures in 1951 and partly because of the unnatural exposure of fir on the edges of the cleared ski slopes. An estimated 2,000 beetle-killed firs occur on and in the immediate vicinity of the ski area. This is a step-up from 720 trees attacked in 1950. It is imperative that indirect or direct control be reactivated early in 1952.

Spruce Budworm on Douglas-fir, Fir, and Spruce

Spruce budworm damage in the central and southern Rocky Mountains is sporadic but serious. It has not been serious in any one area; without control, mature trees have not been completely defoliated or seemingly weakened to the point of being attacked by bark beetles. It is serious enough, in some parts, however, to cause severe mortality and malformation of the understory, potential ornamental tree and Christmas tree stock. This is especially true on the Santa Fe and Carson National Forests. Costs of control could be more than offset by the sale of green ornamentals and Christmas trees.

Sawfly on Pine

Sawfly damage at the Colorado National Monument was prevented in parts of the Monument accessible to mist-blower spraying of DDT emulsion. Unfortunately, the restriction of control to accessible areas precludes reducing the sawfly population to an endemic level through direct control measures. There is yet no indication that natural control is reducing the outbreak.

Matsucoccus on Pinon

The pinon scale continues to cause concern at the Colorado National Monument through the yellowing of pinon foliage and apparent weakening of a few trees. While the outbreak has not noticeably increased, it has not been reduced. No control was carried out in 1951.

Great Basin Tent Caterpillar on Aspen

The widespread outbreak of the Great Basin tent caterpillar in stands of aspen on private and federal lands of southern Colorado and northern New Mexico continues. While spraying infested areas with DDT at the rate of 1 pound per acre is a very effective control, it was not found feasible in 1951 to treat more than some (3,500 acres) of the heavily-used recreation areas on the Carson National Forest and some adjoining private and municipal lands. The results were excellent but only of a temporary nature. An increased market value for aspen would result in a demand for more extensive tent caterpillar control.

Fir Looper on Douglas-fir and White Fir

During August, a reported defoliation of Douglas-fir and white fir on the Lincoln National Forest was investigated. An outbreak of a fir looper severely defoliated Douglas-fir on approximately 7,100 federal, state, and private lands. Some of this defoliation was complete and tree mortality may result. A repeat defoliation in the area should be prevented. Aerial applications of sprays at the rate of 1 pound of the DDT per acre should reduce the outbreak to a normal endemic status. Plans have been made for spraying in 1952.

An infestation of a fir looper on the Lincoln National Forest in 1928 was reported to have been in part put under control by wild turkeys feeding on pupae in and below the duff.

Survey Personnel

B. H. Wilford, in charge
F. B. Knight
W. F. McCambridge
R. M. Loughridge, resigned August 10, 1951

Detailed from the Division of Forest Insect Investigations (other than from the Fort Collins laboratory), Bureau of Entomology and Plant Quarantine, United States Department of Agriculture:

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R. E. Denton, Forest Insect Laboratory, Coeur d'Alene, Idaho
A. T. Drooz, Forest Insect Laboratory, New Haven, Connecticut
W. B. Mates, Forest Insect Laboratory, New Haven, Connecticut
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A. D. Moore, Forest Insect Laboratory, Berkeley, California
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L. Hansen, Berkeley, California
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G. E. Harmon, Berkeley, California
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Detailed from the Roosevelt National Forest, Forest Service, United States Department of Agriculture:

G. A. Ince

Assisting in the supervision of surveys was F. T. Hutchison, now the forest entomologist with the Board of Forestry, State of Colorado

Table 1

FOREST INSECT CONDITIONS IN CENTRAL AND SOUTHERN ROCKY MOUNTAINS AND THE GREAT PLAINS - 1951

General Area	Locality	Insect	Host	Infestation Status (Acres)	(Trees)	Suggested Action
Colorado						
White River N.F. Arapaho N.F. Routt N.F.	Eagle) Kremmling) Rabbit Ears)	Engelmann spruce beetle	Engelmann spruce	80,615	225,000 1/	ODB 2/, EDB 3/, and trap tree 4/ treatment
White River N.F. Arapaho N.F. Routt N.F.	Eagle) Kremmling) Rabbit Ears)	"	"	80,615	86,420 5/	None
Rio Grande N.F.	Wolf Cr. Pass	"	"	10-12,000		Cut & log over-mature trees, ODB treatment in epidemic areas
San Juan N.F.	Missionary Ridge	"	"	8-10,000		Cut & log over-mature trees, ODB treatment in epidemic areas
Rocky Mtn. N.P.	Hidden Valley	"	"	4	25	None
Routt N.F.	Owl Mt.	"	"		250	"
Roosevelt N.F.	Red Feather) Poudre)	Black Hills beetle	Ponderosa pine	26,000	7,700	ODB or EDB treatment
	Estes Park) Boulder)	"	"		700	
Black Forest		"	"		300	Log & burn slabs + ODB or EDB treatments
San Isabel N.F.	San Carlos	"	"		500)	ODB or EDB treatments
	Spanish Peaks	"	"		200)	
	Huerfano	"	"		300)	

San Juan N.F.	Dolores Glade	Black Hills beetle	Ponderosa pine		750	ODB or EDB treatment
Rio Grande N.F.	Del Norte Conejos	" "	" "		350	None
Uncompahgre N.F.	Miguel	"	"		500	ODB or EDB treatment
Rocky Mtn. N.P. Roosevelt N.F.	Estes Park	Douglas-fir beetle	Douglas-fir	Beetle population reduced by "freeze"		None
Pike N.F.	Devil's Head Pikes Peak	Spruce budworm	Douglas-fir	Moderate to heavy defoliation		None
Rocky Mountains (eastern slope)		"	"	Light defoliation		"
Mesa Verde N.P.		Sawfly	Pinon	Scattered trees, light defoliation		DDT mist-blower
		Tent caterpillar	Bitter Brush & Mtn. mahogany	General		"
Colorado N.M.		Sawfly	Pinon	Scattered trees, light defoliation		"
		Matsucoccus	"	Scattered trees, light damage		Dendrol mist-blower
Wyoming						
Bighorn N.F.	Buffalo	Black Hills beetle	Ponderosa pine	5,000 (private)	7,500	None
South Dakota						
Black Hills N.F.		Black Hills beetle	Ponderosa pine	878,636	1,000	ODB or EDB treatment
Harney N.F.		"	"	706,526		"
New Mexico						
Lincoln N.F.	James, Cox, Russia, and Perk Canyons	Dendroctonus & Ips spp.	Ponderosa pine		1,010	None
Cibola N.F.	General	Dendroctonus & Ips spp.	Ponderosa pine	Scattered trees		None

Santa Fe N.F.	Paliza Canyon	Dendroctonus & Ips spp.	Ponderosa pine	2,275	1,320	Log and burn slabs
	" "	Douglas-fir beetle	Douglas-fir	3,800		Log and burn slabs
Cibola N.F.	Sandia	Fir engraver beetle	White fir		2,000	Log and burn slabs or treat with ODB or EDB
		Spruce budworm	" "	Scattered		To be determined
Santa Fe N.F.	General	" "	Douglas-fir, fir, and spruce	Light to heavy defoliations		DDT aerial
Carson N.F.	General	" "	"	Light defoliation		None
Lincoln N.F.	Penasco	Looper	Douglas-fir & White fir	7,100		DDT aerial
Cibola N.F.	Sandia	Twig borers	Pinon & Juniper	General		None
Carson N.F.	Taos Rio Pueblo	Great Basin tent caterpillar	Aspen	6,000 (net)		DDT mist-blower in accessible areas
Bandelier N.M.		Fall webworm	Cottonwood			DDT aerial
Carlsbad Caverns N.P.		Looper	Walnut & willow		300	DDT aerial
Arizona						
Coconino N.F.	Fort Valley Exp. For.	Dendroctonus & Ips spp.	Ponderosa pine	Scattered trees		None
	General	" "	"	" "		"

Nebraska					
Nebraska N.F.	Bessey	Turpentine beetle	Ponderosa Scotch, jack Austrian pines	500	None
	Plantations	Tip moth	Ponderosa pine	Light to heavy	None
Oklahoma					
Platt N.P.		Tent caterpillar, fall webworm	Hardwoods		DDT aerial

1/ includes all full attacks, partial attacks, and 1/3 of basal fill-ins
2/ orthodichlorobenzene
3/ ethylene dibromide
4/ green spruce felled prior to 1952 beetle flight to attract and trap attacking beetles, stems to be logged out of woods or treated with insecticide
5/ includes 2/3 of basal fill-ins

Table 2

MAJOR FOREST INSECT CONTROL PROJECTS IN CENTRAL AND SOUTHERN ROCKY MOUNTAINS AND THE GREAT PLAINS - 1951

General Area	Control Agency	Insect	Host	Control Method	Accomplishments (Acres)	(Trees)
Colorado						
White River N.F.) Arapaho N.F.) Routt N.F.)	U.S. Forest Service	Engelmann spruce beetle	Engelmann spruce	Standing trees treated with ODB		199,002
Rio Grande N.F.) San Juan N.F.)	"	"	"	"		912
San Juan N.F.	"	Black Hills beetle	Ponderosa pine	"		2,258
San Isabel N.F.	"	"	"	"		2,980
Rio Grande N.F.	"	"	"	"		150
Uncompahgre N.F.	"	"	"	"		1,063
Colorado N.M.	National Park Service	Sawfly	Pinon	DDT mist-blower	Picnic camp grounds residential areas & roadsides	
Mesa Verde N.M.	"	"	"	"	810	roadside
	"	Great Basin tent caterpillar	Bitter brush & Mountain mahogany	"		roadside
South Dakota						
Black Hills N.F.) Harney)	U.S. Forest Service	Black Hills beetle	Ponderosa pine	Standing trees treated with ODB		1,278
New Mexico						
Carson N.F.	U.S. Forest Service	Great Basin tent caterpillar	Aspen	DDT mist-blower	3,500	
Carlsbad Caverns N.P.	National Park Service	Looper	Walnut & willow	DDT aerial	4	